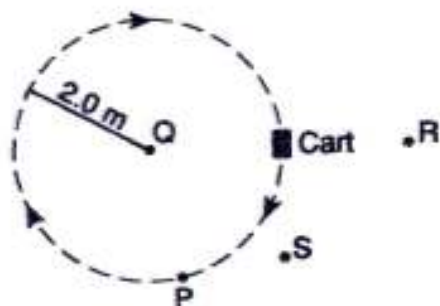


Base your answers for questions 1 and 2 on the following information. The diagram shows a 5.0-kilogram cart traveling clockwise in a horizontal circle of radius 2.0 meters at a constant speed of 4.0 meters per second.



1. If the mass of the cart was doubled, the magnitude of the centripetal acceleration of the cart would be

(1) unchanged (3) halved
(2) doubled (4) quadrupled

2. At the position shown, the velocity of the cart is directed toward point

(1) P (3) R
(2) Q (4) S

3. Base your answer on the information below.

A 100-kilogram satellite moves in a circular orbit around the Earth at a distance of one Earth radius (r) above the Earth's surface. The satellite is moving at speed v .

The centripetal acceleration of the satellite can be expressed as

(1) $a = \frac{f}{m}$ (3) $a = \frac{v}{t}$

(2) $a = \frac{v^2}{2r}$ (4) $a = \frac{v^2}{\sqrt{r}}$

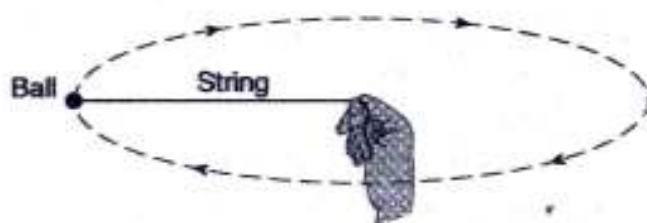
4. Base your answer on the diagram below which represents a 4.0×10^2 -kilogram satellite, S, in a circular orbit at an altitude of 5.0×10^6 meters. The orbital speed of the satellite is 6.0×10^3 meters per second and the radius of the Earth, R , is 6.4×10^6 meters.

The centripetal acceleration of the satellite is closest to

(1) 9.8 m/s^2 (3) 3.2 m/s^2
(2) 4.9 m/s^2 (4) 1.6 m/s^2

R

Base your answers for questions 5 through 7 on the diagram below. The diagram shows a student spinning a 0.10-kilogram ball at the end of a 0.50-meter string in a horizontal circle at a constant speed of 10. meters per second. [Neglect air resistance.]



5. If the magnitude of the force applied to the string by the student's hand is increased, the magnitude of the acceleration of the ball in its circular path will

- (1) decrease
- (2) increase
- (3) remain the same

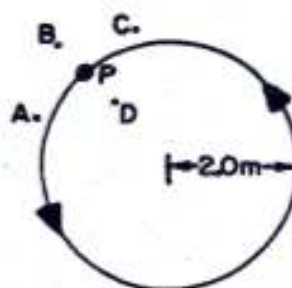
6. The magnitude of the centripetal force required to keep the ball in this circular path is

- (1) 5.0 N
- (2) 10. N
- (3) 20. N
- (4) 200 N

7. Which is the best description of the force keeping the ball in the circular path?

- (1) perpendicular to the circle and directed toward the center of the circle
- (2) perpendicular to the circle and directed away from the center of the circle
- (3) tangent to the circle and directed in the same direction that the ball is moving
- (4) tangent to the circle and directed opposite to the direction that the ball is moving

8. Base your answer on the diagram below which shows the path of an object moving counterclockwise in a circle of radius 2.0 meters. The speed of the object is 6.0 meters per second and the mass of the object is 0.2 kilogram.

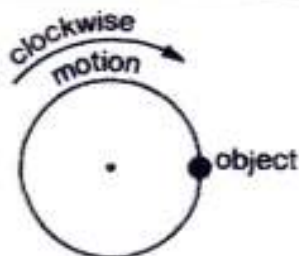


When the object is at point P, the direction of the acceleration of the object is toward point

- (1) A
- (2) B
- (3) C
- (4) D

D10

9. The diagram to the right shows an object traveling clockwise in a horizontal, circular path at constant speed.



Which arrow best shows the direction of the centripetal acceleration of the object at the instant shown?

(1) ←

(3) ↓

(2) →

(4) ↑

10. An object traveling with uniform circular motion has a centripetal acceleration due to the change in

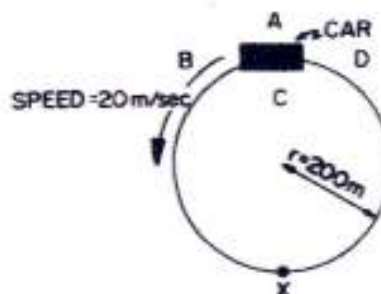
(1) speed

(3) kinetic energy

(2) direction

(4) mass

11. Base your answer on the diagram below which represents a car of mass 1,000 kilograms traveling around a horizontal circular track of radius 200 meters at a constant speed of 20 meters per second.



When the car is in the position shown, the direction of its centripetal acceleration is toward

(1) A

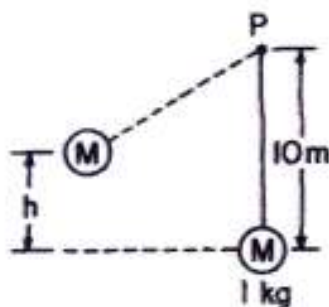
(3) C

(2) B

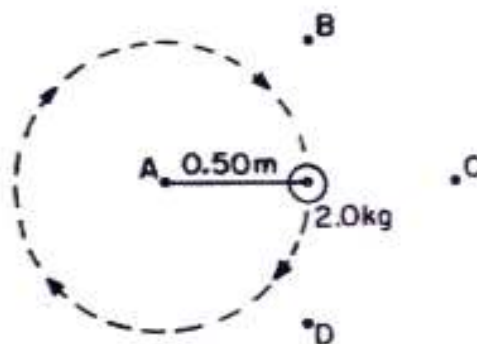
(4) D

P

Base your answers for questions 12 and 13 on the diagram below which represents an object M suspended by a string from point P . When object M is swung to a height of h and released, it passes through the rest position at a speed of 10 meters per second.



Base your answers for questions 14 and 15 on the diagram below which represents a 2.0-kilogram mass moving in a circular path on the end of a string 0.50 meter long. The mass moves in a horizontal plane at a constant speed of 4.0 meters per second.



12. The centripetal force on object M could be halved as it passes through the rest position by doubling the
- weight of the object, only
 - length of the string, only
 - height h and the weight of the object
 - the length of the string and the height h
13. The centripetal force on object M as it passes through the rest position is approximately
- | | |
|----------|-------------|
| (1) 10 N | (3) 100 N |
| (2) 50 N | (4) 1,000 N |
14. The force exerted on the mass by the string is
- | | |
|----------|----------|
| (1) 8 N | (3) 32 N |
| (2) 16 N | (4) 64 N |
15. In the position shown in the diagram, the momentum of the mass is directed toward point
- | | |
|-------|-------|
| (1) A | (3) C |
| (2) B | (4) D |